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10/507,273	09/03/2004	Avto Tavkhelidze	12078	4003

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EXAMINER	
HINES, ANNE M	
ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 12/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/507,273	TAVKHELIDZE ET AL.	
	Examiner	Art Unit	
	Anne M. Hines	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 September 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/3/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

The abstract of the disclosure is objected to because the cover sheet for the document WO/03/090245 A1 has been submitted instead of the required abstract. The abstract should be one paragraph of 150 words or less. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-11, 13-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Tavkhelidze et al. (US Pat. No. 6,869,855).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the

inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Regarding claim 1, Tavkhelidze teaches a diode device comprising: a tubular housing; a first electrode attached to one end of said tubular housing; a second electrode attached to an opposing end of said tubular housing; an electrical circuit connected to said electrodes; a further pair of electrodes attached to an inner and outer face of said tubular housing and attached to controlling circuitry; wherein said housing consists of an actuating element whose length may be modified by a signal applied to said further pair of electrodes, whereby the magnitude of a distance separating said electrodes may be adjusted (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 2, Tavkhelidze teaches wherein said actuating element comprises a piezo-electric element (Column 7, line 20; Column 7, lines 60-62).

Regarding claim 3, Tavkhelidze teaches wherein said piezo-electric element comprises quartz (Column 7, line 20; Column 7, lines 60-62).

Regarding claim 4, Tavkhelidze teaches wherein said tubular housing has a circular cross-section (Fig. 6; Column 7, line 20).

Regarding claim 5, Tavkhelidze teaches wherein said first electrode and said second electrode comprise a matched pair of electrodes (Fig. 7, 404 & 406).

Regarding claim 6, Tavkhelidze teaches wherein said first electrode comprises titanium (Column 7, line 36).

Regarding claim 7, Tavkhelidze teaches wherein said second electrode comprises silver (Column 7, line 39).

Regarding claim 8, Tavkhelidze teaches wherein said first electrode is in thermal contact with a heat source, and said second electrode is in thermal contact with a heat sink, and said electrical circuit connects said first and second electrodes to an electrical load (Column 1, lines 17-22).

Regarding claim 9, Tavkhelidze teaches wherein said first electrode is in thermal contact with a mass to be cooled, and said second electrode is in thermal contact with a heat sink, and said electrical circuit connects said first and second electrodes to a power supply (Column 1, lines 17-22).

Regarding claim 10, Tavkhelidze teaches wherein said diode device is selected from the group consisting of: a Power Chip, a Cool Chip or a Gap Diode (Fig. 7, 404 & 406).

Regarding claim 11, Tavkhelidze teaches wherein said diode device is selected from the group consisting of: thermionic converter, thermo-tunneling converter, vacuum diode heat pump, and photoelectric converter (Column 1, lines 17-22).

Regarding claim 13, Tavkhelidze teaches comprising the steps: (a) contacting a first composite to one end of a tubular actuating element; introducing an electrically conducting material to an inner surface of said composite; (c) contacting a second composite to the other end of the tubular actuating element, wherein said composite is a matching electrode pair precursor comprising at least two different layers, such that an inner surface of said second composite is also in contact with the electrically conducting material; (d) sealing the contact between the first composite and the tubular element, and between

the second composite and the tubular element; (e) separating the second composite along a boundary between two different layers and forming two matching electrodes (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 14, Tavkhelidze teaches wherein said second composite comprises a silicon wafer, a layer of titanium, a layer of silver, and a layer of copper (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 15, Tavkhelidze teaches wherein step (c) additionally comprises seating an alignment pin on said second composite into a locating hole on said first composite (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 16, Tavkhelidze teaches wherein said second composite is fabricated according to the steps: (a) polishing at least a region around the periphery of a silicon wafer; (b) depositing a first layer on said silicon wafer; (c) depositing a second layer on said first layer; (d) forming a third layer on said second layer (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 17, Tavkhelidze teaches wherein said first layer comprises titanium (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 18, Tavkhelidze teaches wherein said second layer comprises silver (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 19, Tavkhelidze teaches wherein said third layer comprises copper (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 20, Tavkhelidze teaches wherein the method for forming said third layer of copper comprises electrolytic growth of copper (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 21, Tavkhelidze teaches the method of claim 19 additionally comprising the step of: attaching an alignment pin to said third layer (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 22, Tavkhelidze teaches wherein said attaching step comprises: (a) contacting said alignment pin with said third layer; (b) electrolytically growing copper from said third layer around the alignment pin (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 23, Tavkhelidze teaches wherein said first composite comprises molybdenum (Column 6, lines 64-65).

Regarding claim 24, Tavkhelidze teaches wherein said electrically conducting material comprises silver paste (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 25, Tavkhelidze teaches wherein said electrically conducting material comprises liquid metal (Fig. 7; Column 7, line 17 to Column 8, line 21).

Regarding claim 26, Tavkhelidze teaches wherein said liquid metal comprises gallium and indium (Fig. 7; Column 7, line 17 to Column 8, line 21).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which

said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-2, 4-5, 8, 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fitzpatrick et al. ("Close-Spaced Thermionic Converters with Active Spacing Control and Heat-Pipe Isothermal Emitters") in view of Nishioka et al. (US Pat. No. 4,880,975).

Regarding claims 1 and 2, Fitzpatrick teaches a diode device comprising: a first electrode attached to one end of three piezoelectric translators and a second electrode attached to the opposing end of the three piezoelectric translators and wherein the piezoelectric translators lengths are attached to controlling circuitry and modified by a signal so that the magnitude of a distance separating said electrodes is adjusted (page 926, Fig. 7; page 924). Fitzpatrick also teaches wherein three piezoelectric translators are provided in order to maintain parallel electrode surfaces (page 924). Fitzpatrick fails to teach wherein the piezoelectric translators are a tubular housing and a further pair of electrodes are attached to the inner and outer faces of the tubular housing. Nishioka teaches a piezoelectric cylinder (Fig. 1, 2; Column 2, lines 54-55) with a pair of electrodes attached to the inner and outer faces of the tubular housing (Fig. 1, 3; Column 2, lines 57-59; Column 3, lines 5-8) in order to finely control the tunneling current between a probe and a sample in a scanning electron microscope (Column 1, lines 14-29). It would have been obvious to one of ordinary skill in the art to modify the invention of Fitzpatrick to have a tubular piezoelectric housing with a pair of electrodes on the inner and outer faces, as disclosed by Nishioka,

in order to finely control the tunneling current between the first and second electrodes.

Regarding claim 4, Nishioka further teaches wherein the piezoelectric actuator has a circular cross section (Fig. 1, 2; Column 2, lines 54-55). Motivation to combine is the same as for claim 1.

Regarding claim 5, Fitzpatrick further discloses wherein the first and second electrodes are a matched pair (page 924, both electrodes are flat).

Regarding claim 8, Fitzpatrick further discloses wherein the first electrode is in thermal contact with a heat source, and said second electrode is in thermal contact with a heat sink, and said electrical circuit connects said first and second electrodes to an electrical load (page 920).

Regarding claim 9, Fitzpatrick teaches wherein the first electrode is in thermal contact with a heat source, and said second electrode is in thermal contact with a heat sink, and said electrical circuit connects said first and second electrodes to an electrical load (page 920). Fitzpatrick fails to teach wherein the first and second electrodes are connected to a power supply. However, one of ordinary skill in the art would reasonably contemplate connecting the first and second electrodes to a power supply in order to use the invention of Fitzpatrick as a heat pump. Therefore, it would have been obvious to one of ordinary skill in the art to modify the invention of Fitzpatrick by connecting the first and second electrodes to a power supply in order to use the invention as a heat pump.

Regarding claims 10 and 11, Fitzpatrick further discloses wherein said diode device is both a thermionic converter and a gap diode (page 924).

Regarding claim 12, Fitzpatrick and Nishioka fail to disclose the limitation wherein the magnitude of the distance separating the electrodes is between 0.1 and 100 nm. One skilled in the art would reasonably contemplate optimization of the distance between the electrodes as a matter of design engineering in order to provide a small air gap to limit the thermionic leakage around the collector. Furthermore, applicants claimed separation distance does not solve any of the stated problems or yield any unexpected result that is not within the scope of the teaching applied. Therefore, it would have been obvious to one of ordinary skill in the art to modify the invention of Fitzpatrick and Nishioka by reducing the separation distance between the electrodes in order to provide a small air gap to limit the thermionic leakage around the collector.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fitzpatrick et al. ("Close-Spaced Thermionic Converters with Active Spacing Control and Heat-Pipe Isothermal Emitters") and Nishioka et al. (US Pat. No. 4,880,975) in view of Johnston (US Pat. No. 3,600,933).

Regarding claim 3, Fitzpatrick and Nishioka teach the invention of claim 2, but fail to teach wherein the tubular piezoelectric actuator is quartz. Johnston teaches wherein a tubular piezoelectric actuator is quartz (Column 2, lines 69-72). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to choose from one of the materials disclosed by Johnston for the tubular piezoelectric actuator, since it has been held to be within

the general skill of the worker in the art to select a known material on the basis of its suitability for the intended use. See MPEP 2144.07.

Claims 6-7, 13-26 are rejected under 35 U.S.C. 103(a) as being obvious over Fitzpatrick et al. ("Close-Spaced Thermionic Converters with Active Spacing Control and Heat-Pipe Isothermal Emitters") and Nishioka et al. (US Pat. No. 4,880,975) in view of Tavkhelidze et al. (US Pat. No. 6,869,855).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anne M. Hines whose telephone number is (571) 272-2285. The examiner can normally be reached on Monday through Friday from 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MSM 12/21/05
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